p|16|00   A

IN THE UNITED STATES PATENTAND TRADEMARK OFFICE
UTILITY PATENT APPLICATION TRANSMITTAL UNDER 37 CFR 1.53(b)

Address to:	*Attorney Docket No.*	11403/5
Assistant Commissioner for Patents	*Inventor(s)*	MARKUS KLAUSNER and ARNE DIETRICH
Box Patent Application	*Express Mail Label No.*	EL566657414US
Washington, DC 20231	*Total Pages*	27

Title of Application:

WIRELESS ACCESS TO CLOSED EMBEDDED NETWORKS

Transmitted with the patent application are the following:

__2__	Page(s)	Transmittal form (and one copy)
__17__	Page(s)	Cover Page (1), Specification (9), claims (6), abstract (1)
__3__	Page(s)	Informal drawing
__5__	Page(s)	Declaration and Power of Attorney (unsigned)
____	Page(s)	Recordation of Assignment and Assignment form
____	Page(s)	Information Disclosure Statement (IDS)
____	Page(s)	Certified copy of:

This application is a ___ Continuation / Continuation-in-Part / Divisional of prior application Serial No. _____, filed _____.

Fee calculation for large entity:	No. Filed	No. Allowed	No. Extra	Rate	Fee
Basic Fee					$710.00
Total Claims	33	20		× 18.00	$234.00
Independent Claims	3	3		× 80.00	
Multiple Dependent Claim				+ 260.00	
				Assignment	
				Total	$944.00

The Commissioner is hereby authorized to charge payment of any fees associated with this communication or arising during thependency of this application per 37 CFR §1.16–1.21, or to credit any overpayments, to Deposit Account **11-0600**.

Express Mail Certificate

I hereby certify that the above paper/fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated below and is addressed to the Assistant Commissioner for Patents, Washington, DC 20231

Date of deposit: October /2, 2000

Person mailing paper/fee: Pilar Rodriguez

Signature _____

Respectfully submitted,

Shawn O'Dowd

Shawn W. O'Dowd (Reg. No. 34,687)
Attorney for Applicant(s)

Kenyon & Kenyon
333 W. San Carlos Street, Suite 600
San Jose, CA 95110
(408) 975-7500 - Telephone
(408) 975-7501 - Facsimile

UNITED STATES PATENT APPLICATION
FOR

WIRELESS ACCESS TO CLOSED EMBEDDED NETWORKS

INVENTOR(S):

MARKUS KLAUSNER
ARNE DIETRICH

PREPARED BY:

KENYON & KENYON

333 W. SAN CARLOS ST., SUITE 600
SAN JOSE, CALIFORNIA 95110

408-975-7500

Express Mail No. EL566657414US
11403/5

Field of the Invention

The present invention relates to a protocol translation device. More specifically, a protocol translation device is provided that can be used for automotive diagnostic purposes as well as other purposes.

5

Background Information

Access to in-vehicle electronics is known in the art. Access to in-vehicle electronics currently requires special hardware that is connected directly to the vehicle bus through an OBDII (On-Board Diagnostic) connector or some other physical connection. Further, hardware that is dedicated to a certain kind of wireless link (e.g., Groupe Spécial Mobile (GSM) phone) has been proposed for remote diagnosis.

There are several inherent problems with the current method of accessing in-vehicle electronic information. One problem is the amount of time it can take to attach the OBDII connector. Also, it may be difficult to find the OBDII connector within the engine bay or in another spot in the vehicle if one is not entirely familiar with the layout of the car, adding to the total time exhausted.

Another problem with the current method of attachment to the in-vehicle electronics is the limitation upon freedom of movement for the operator. With the connector attached to the vehicle, the operator is forced to avoid the connector line as he moves around the vehicle while repairing the vehicle, etc. This could affect an operator's efficiency. There could also be a hazard of tripping over the wire as the operator moves back and forth around the vehicle.

Further, another limitation of the prior art is the necessity for the presence of the vehicle for physical attachment to the operator's equipment. In order to access the in-vehicle electronics,

an actual physical connection must be made. This can be inconvenient for the vehicle owner.

Also, in the case of a mechanic's usage of the prior art for access to in-vehicle electronics, a

problem exists diagnosing intermittent problems and problems occurring only during vehicle

operation. With the prior art, a vehicle's electronics cannot be accessed in real time while the car

5   is in motion.

By providing a means to access the vehicle electronics without the requirement of a

physical connection, the present invention eliminates the above-mentioned problems. In view of

the above and for other reasons, there is a need for a system and method that provides wireless

access to a bus, such as that provided in an automobile.

10

Summary of the Invention

A protocol translation device is disclosed that may include two different protocols and an

intermediate, network-independent protocol. In one embodiment of the invention, an emerging

worldwide standard, Bluetooth, created by the Wireless Personal Area Network (WPAN)

15   Working Group (IEEE 802.15), provides a wireless interface to the electronics in the vehicle via

a Controller Area Network (CAN). CAN is an international standard documented in ISO 11898

(for high-speed applications) and ISO 11519 (for lower-speed applications). A remote

application can connect to this interface via a Bluetooth host in the vehicle or in communication

20   range of the vehicle. Such a Bluetooth host could be a mobile phone or an onboard computer.

According to an embodiment of the present invention, a protocol translation can occur

from Controller Area Network (CAN) protocol to Bluetooth protocol, and the signal in the

Bluetooth protocol can then be transmitted from the vehicle's electronic systems' bus to an

2

external receiver via a wireless link.

Such an interface would enable external devices to subscribe to certain signals on the vehicle bus or interrogate a vehicle's electronic control units (ECUs) without interfering with the vehicle's operation.

5   Aftermarket products are emerging that notify other drivers of traffic conditions such as traffic jams and accidents. These systems could be greatly enhanced if they had access to data on the vehicle bus, as this would improve the system's knowledge about the state of every participating vehicle.

10

Brief Description Of The Drawings

Figure 1 shows a block diagram of protocol translation according to one possible embodiment of the present invention.

Figure 2 shows an embodiment of the protocol translation system of Figure 1 operating in

15   an automotive environment.

Figure 3 provides a block diagram of a specific CAN-to-Bluetooth embodiment of the present invention.

20   ## Detailed Description

Figure 1 shows a block diagram of the protocol translation according to an embodiment of the present invention. A first driver, which is denoted in the embodiment of Figure 1 as the 'in' side of the Network Driver 100, receives a message of a first protocol from a given network for translation. The Network Driver 100 first converts the received message of the first protocol

25   to a new, network-independent protocol. The Network Driver 100 then passes the message to a

3

Message Dispatcher 102 whereupon the Message Dispatcher 102 consults a Rules Database 104

to determine which Message Handler 106 out of a plurality of Message Handlers 106 to forward

the network-independent message. The Message Handler 106 fills the destination fields of the

message. The Message Handlers 106 utilize specialized packet translation involving address

5   changes, network changes segmentation/desegmentation, etc. The Message Handlers 106 further

provide accessibility of external applications for signal extraction, etc.

The Message Handler 106 involved in the transfer then forwards the message to a

Network Multiplexer 108, which consults the address and network fields of the network-

independent message to identify the destination network. A Network Configuration Unit 110 is

10   utilized by the Network Multiplexer 108 to configure and connect the gateway software

components for such things as system startup and maintenance and for dynamic reconfiguration.

The Network Multiplexer 108 then passes the network-independent message to a second

driver, which is denoted as the 'out' side of the Network Driver 100. The Network Driver 100

then converts the network-independent message to a second protocol. The message is forwarded

15   on from the Network Driver 100 to a third driver, called External Driver 112, from which the

message is utilized by a remote host of some type.

Figure 2 shows this protocol translation system operating in an automotive environment.

In the depicted embodiment, the vehicle bus 200 within the vehicle 202 provides a pathway for

20   data communication between various electronic components located throughout the vehicle. The

data being passed upon the vehicle bus is accessed by a first network driver, which, similar to

Figure 1, is denoted as 'Network Driver - in' 100. The data message received by Network

Driver 100 is converted to a network-independent protocol, as is stated above, and then the

4

message is passed to a Message Dispatcher 102, which utilizes a Rules Database 104 to

determine which Message Handler 106 should receive the message. As stated previously, upon

receipt of the network-independent message, the Message Handler 106 fills the destination fields

of the message and utilizes specialized packet translation involving address changes, network

5   changes segmentation/desegmentation, etc.

The Message Handler 106 forwards the network-independent message to a Network

Multiplexer 108, which consults the address and network fields of the message to identify the

destination network. As stated above, a Network Configuration Unit 110 is utilized by the

Network Multiplexer 108 to configure and connect the gateway software components for such

10   things as system startup and maintenance and for dynamic reconfiguration.

The Network Multiplexer 108 then passes the network-independent message to a second

driver, which is denoted as 'Network Driver - out' 100. The Network Driver 100 then converts

the network-independent message to a second protocol. The message is forwarded on from the

Network Driver 100 to a third driver, called External Driver 112, from which the message is

15   utilized by a Remote Computer 204.

Figure 3 provides a block diagram of a specific CAN-to-Bluetooth embodiment of the

present invention. As is previously stated, the present invention concerns a node in an

in-vehicle bus network that comprises gateway functionality for passing messages from the in-

20   vehicle bus to a remote host, and a wireless communication chipset for establishing,

maintaining, and controlling a wireless link between the node and one or several remote hosts.

In the following, the invention is described for a CAN as the in-vehicle communication protocol

5

and Bluetooth as short-range wireless communication standard. Figure 3 depicts the core concept of this embodiment of the present invention.

The CAN-Bluetooth gateway node (CBGWN) 307 includes a Bluetooth host 305 and Bluetooth hardware 306 connected via a host controller interface (HCI) 304. The Bluetooth host comprises a CAN controller 301, a remote service controller (RSC) 302, a protocol converter 303, and a host controller interface device 304. The Bluetooth hardware 306 enables a wireless link to other Bluetooth hardware (309.1...309.n) connected to Bluetooth hosts (308.1...308.n) via an HCI. This setup enables a remote application, which does not necessarily reside on any of the remote Bluetooth hosts (308.1...308.n), to communicate with the RSC 302. Such a remote application could be a diagnosis program on a server that is linked to the CBGWN through a mobile phone that is one of the Bluetooth hosts (308.1...308.n).

The CAN controller 301 controls the communication with the Vehicle Bus 200 (Figure 2). Signals contained in CAN messages that pass the acceptance filter of the CAN controller 301 are passed on to the protocol converter 303. The protocol converter 303 retrieves CAN signals from CAN messages, computes the actual physical value of signals such as speed or RPM (typically by applying a scaling factor), and then puts them in the payload of the target protocol's protocol data units (PDUs). In an advantageous implementation, the CAN signals are directly assigned to data packets that can be sent via the host controller interface (HCI) to the Bluetooth host controller. The RSC 302 controls which signals are put in the PDUs as described later. The gateway functionality of the protocol converter also comprises: the readressing (1:n) of messages based on subscriber management implemented in the RSC 302 (see below); the resequencing (i.e., changing the temporal order of received and retransmitted messages); and the changing of timing behavior.

6

If a packet-switched connection exists between CBWGN 307 and a remote application, the link between the CAN-connected Bluetooth host 305 and a remote Bluetooth host (308.1...308.n) is an asynchronous connection-less link (ACL link). Next, the CAN signals are assigned to HCI ACL packets. Recommended Standard 232 (RS232) as specified by the

5 Electrical Industries Association (EIA) could serve as the HCI transport layer, for example. It is possible to assign one PDU to each incoming CAN message, one PDU to each incoming signal, and one PDU to several incoming CAN messages and signals.

The data rate and the throughput of the wireless link are among the factors that determine the allocation procedure.

10 In this embodiment, no remote application that connects to the CBGWN 307 has direct access to the CAN in the vehicle. This means, no remote application can generate CAN messages. Yet, to go beyond the capability of passively listening to bus traffic, the transmission of CAN messages by the CBGWN 307 is supported as follows: The RSC 302 stores a predefined set of CAN messages that the CAN gateway node can transmit on the bus, along with

15 the identifiers and rules for the messages that are allowed to be transmitted (e.g. debounce time for event-triggered messages and period for periodic messages). This ensures that the worst-case bus load can be analyzed without any knowledge of future remote applications. CAN messages that the CBGWN 307 is allowed to transmit would typically include challenge-response message schemes for diagnosis. When such a message is sent to an ECU,

20 the ECU sends a reply containing failure codes or more generally, certain data from its memory. To initiate the transmission of challenge-response messages, a remote application sends a request via a remote Bluetooth host (308.1...308.n) to the RSC 302. After authenticating and authorizing the remote application (see below), the RSC 302 initiates the transmission of the

7

messages via the CAN controller 301. Also, the RSC 302 notifies the protocol converter 303 to assign the signals contained in the response messages to PDUs to be passed on to the remote application.

The protocol converter 303 has a-priori knowledge of the start bits and length of the

5   signals in each received CAN message that can pass the acceptance filter and assigns them to PDUs that can be interpreted by the remote Bluetooth host (308.1...308.n). For this purpose, in the CBWGN, a list is stored of CAN messages and the signals contained therein as well as the corresponding PDUs of the target protocol.

In an advantageous implementation, each remote host (308.1...308.n) is authenticated by

10   the RSC 302. In an authorization procedure, the RSC 302 verifies the subscription privileges of the remote application (not necessarily the remote host). The subscription privileges concern the list of signals to which a remote application can subscribe. Also, the subscription privileges would indicate whether the remote application is allowed to initiate challenge-response schemes. The communication between the remote application and the RSC 302 can be

15   encrypted independently of the encryption functionality provided by Bluetooth. In an advantageous application, a public key encryption method is used, where the private key of the CBGWN 307 is stored in the CBGWN 307 and is unknown to others. Remote applications that want to subscribe to messages must obtain the public key for the CBGWN 307, which gives a manufacturer some control of the subscribers. Moreover, the public keys of the remote

20   applications would need to be stored in the CBGWN 307, allowing only applications that have the corresponding private key to communicate with the CBGWN 307. An alternative to this method would be a ticket-based authentication method such as Kerberos, a network

authentication protocol designed by Massachusetts Institute of Technology to provide strong

authentication for client/server applications by using secret-key cryptography.

The CBGWN 307 is not necessarily a stand-alone ECU. The described functionality

could be implemented in an existing ECU or in a distributed system. The overall vehicle bus

5   architecture determines to which bus the CBGWN 307 should be connected. It is essential that

all data of interest are available to the CBGWN 307. If these data originate from ECUs that are

connected to a bus other than the bus to which the CBGWN 307 is connected, a

wireline-to-wireline gateway (e.g., CAN-CAN) between the two buses would ensure that the

messages of interest are passed on to the CBGWN 307. For example, if the GBGWN 307 is

10   attached to the powertrain CAN and needs data from the airbag controller (e.g., for an accident

notification application), a gateway should exist between the powertrain CAN and the CAN to

which the airbag controller is attached.

Although several embodiments are specifically illustrated and described herein, it will be

appreciated that modifications and variations of the present invention are covered by the above

15   teachings and within the purview of the appended claims without departing from the spirit and

intended scope of the invention.

What Is Claimed Is:

1   1.   A method for translating a message of a first protocol received by a first driver to a

2   second protocol transmitted by a second driver, comprising:

3   converting the message received by the first driver to an independent format;

4   transmitting the message from the first driver to a second driver via a message handler;

5   and

6   converting the message received by the second driver in the independent format to the

7   second protocol; where

8   the first driver and the second driver are located in a vehicle and the first protocol is a

9   vehicular protocol; and

10   the second protocol is a wireless link.

1   2.   The method of claim 1, further comprising:

2   receiving the message from the first driver by a message dispatcher before transmitting

3   the message to a message handler, wherein the message dispatcher selects the message handler

4   from a set of one or more message handlers by consulting a database.

1   3.   The method of claim 2, further comprising:

2   receiving the message from the message handler by a multiplexer before transmitting the

3   message to the second driver;

1   4.   The method of claim 3, wherein the multiplexer utilizes a network configuration unit for

2   at least one of system startup, maintenance, and dynamic reconfiguration.

1   5.   The method of claim 1, further comprising:

2   performing a manipulation on the message in the message handler.

1   6.   The method of claim 5, wherein the manipulation includes at least one of packet

2   translation or interaction with a computer application.

1   7.   The method of claim 1, further comprising transmitting the message from the second

2   driver to a third driver

1   8.   The method of claim 3, wherein the multiplexer is a network multiplexer.

1   9.   The method of claim 2, wherein the database is a rules database.

1   10.   The method of claim 1, further comprising transmitting the message from the second

2   driver to the third driver in the second protocol by wireless communication.

1   11.   The method of claim 1, wherein the first protocol is a Controller Area Network protocol.

1   12.   The method of claim 1, wherein the second protocol is a Bluetooth protocol.

1   13.   The method of claim 10, wherein the message received by the third driver is translated

2   back to the first protocol and received by a fourth driver.

1   14.   The method of claim 10, wherein a remote application in communication with the third

2   driver is capable of receiving the message.

1   15.   The method of claim 14, wherein the remote application is capable of either passively

2   receiving the message or initiating a transmission from the third driver back to the second driver

3   for translation and receipt at the first driver in the first protocol.

1   16.   The method of claim 15, wherein the third driver is unable to communicate with the

2   second driver unless the third driver adheres to predefined transmission rules and transmits

3   messages from only a predefined group of possible messages.

1   17.   A system for translating a message of a first protocol to a second protocol, comprising:

2   a first driver to receive the message of the first protocol and convert the message to an

3   independent format;

4   a message handler to receive said message from said first driver; and

5   a second driver to receive said message from said message handler and to convert the

6   message received in the independent format to the second protocol; where

7   the first driver and the second driver are located in a vehicle and the first protocol is a

8   vehicular protocol; and

9   the second protocol is a wireless link.

1   18.   The system of claim 17, further comprising:

2   a message dispatcher to receive the message from the first driver before transmitting the

3   message to the message handler, wherein the message dispatcher is adapted to the message

4   handler from a set of one or more message handlers by consulting a database.

1   19.   The system of claim 18, wherein a multiplexer is to receive the message from the

2   message handler before transmitting the message to the second driver;

1   20.   The system of claim 19, wherein the multiplexer is to utilize a network configuration unit

2   for at least one of system startup, maintenance, and dynamic reconfiguration.

1   21.   The system of claim 17, wherein the message handler is to perform a manipulation on the

2   message.

1   22.   The system of claim 21, wherein the manipulation includes at least one of packet

2   translation and interaction with a computer application.

1   23.   The system of claim 17, further comprising a third driver coupled to the second driver.

1   24.   The system of claim 19, wherein the multiplexer is a network multiplexer.

1   25.   The system of claim 18, wherein the database is a rules database.

1   26.   The system of claim 17, wherein the message is transmitted from the second driver to a

2   third driver in the second protocol by wireless communication.

1   27.   The system of claim 17, wherein the first protocol is a Controller Area Network protocol.

1   28.   The system of claim 17, wherein the second protocol is a Bluetooth protocol.

1   29.   The system of claim 26, wherein the message received by the third driver is translated

2   back to the first protocol and received by a fourth driver.

1   30.   The system of claim 26, wherein a remote application in communication with the third

2   driver is capable of receiving the message.

1   31.   The system of claim 30, wherein the remote application is capable of either passively

2   receiving the message or initiating a transmission from the third driver back to the second driver

3   for translation and receipt at the first driver in the first protocol.

1   32.   The system of claim 32, wherein the third driver is unable to communicate with the

2   second driver unless the third driver adheres to predefined transmission rules and transmits

3   messages from only a predefined group of possible messages.

1   33.   A system for translating a message of a Controller Area Network protocol to a Bluetooth

2   protocol, comprising:

3   a first driver to receive the message of the Controller Area Network protocol and convert

4   the message to an independent format;

14

5   a message handler to receive said message from said first driver;

6   a second driver to receive said message from said message handler and to convert the

7   message received in the independent format to the Bluetooth protocol;

8   a message dispatcher to receive the message from the first driver before transmitting the

9   message to the message handler, wherein the message dispatcher is adapted to the message

10   handler from a set of one or more message handlers by consulting a rules database; and

11   a third driver coupled to the second driver;

12   where

13   the first driver and the second driver are located in a vehicle;

14   a network multiplexer is to receive the message from the message handler before

15   transmitting the message to the second driver;

16   the network multiplexer is to utilize a network configuration unit for at least one of

17   system startup, maintenance, and dynamic reconfiguration;

18   the message handler is to perform a manipulation on the message that includes at least

19   one of packet translation and interaction with a computer application;

20   the message is transmitted from the second driver to the third driver in the Bluetooth

21   protocol by wireless communication; and

22   a remote application in communication with the third driver is capable of either passively

23   receiving the message or initiating a transmission from the third driver back to the second driver

24   for translation and receipt at the first driver in the Controller Area Network protocol.

Abstract of the Disclosure

A method and system is provided for a protocol translation device that may include two different protocols and an intermediate, network-independent protocol. In an embodiment of the invention, an emerging worldwide standard, Bluetooth, provides a wireless interface to the electronics in an automotive vehicle via the de-facto standard for vehicle buses, Controller Area Network (CAN). A remote application can connect to this interface via a Bluetooth host in the vehicle or in communication range of the vehicle.
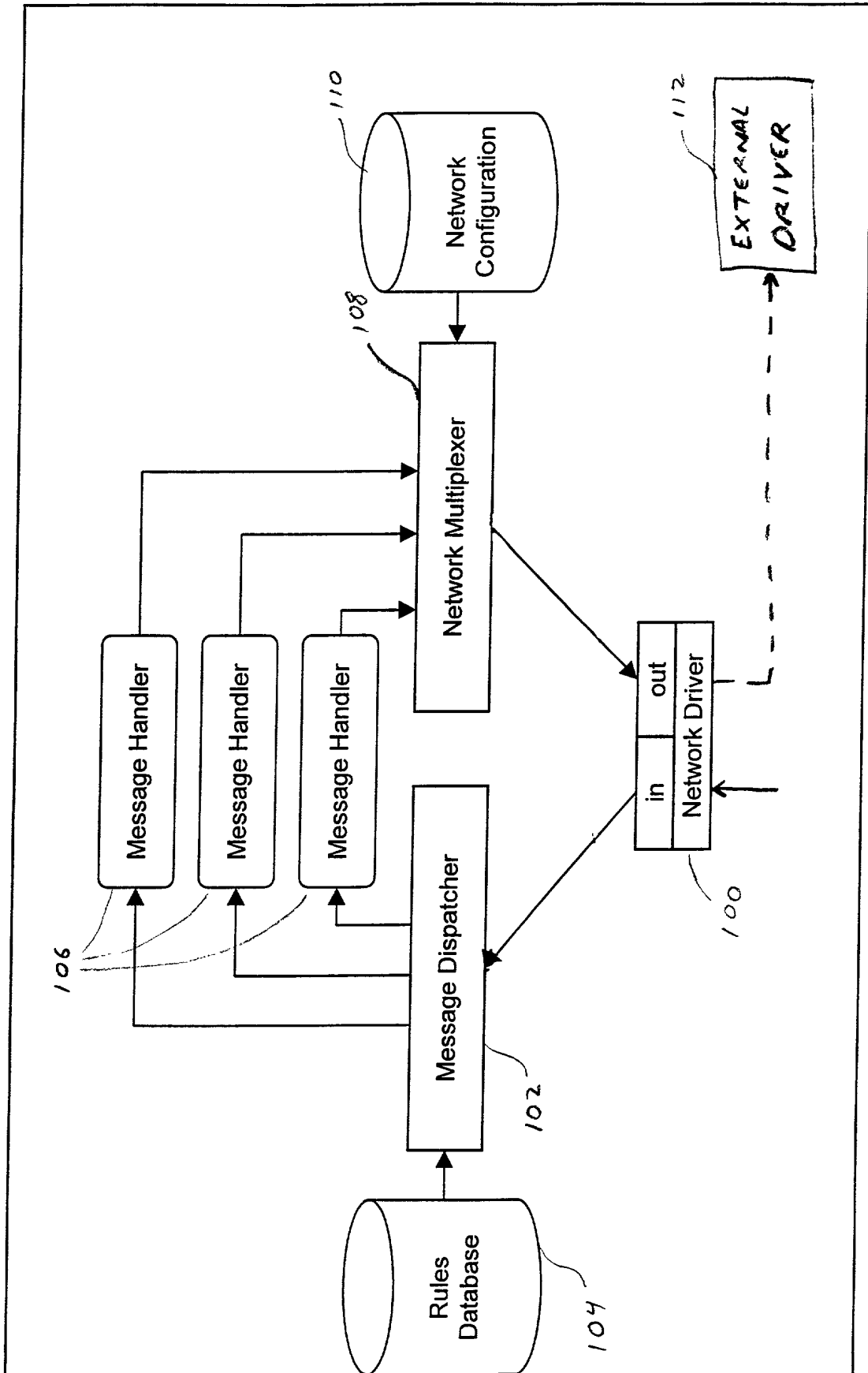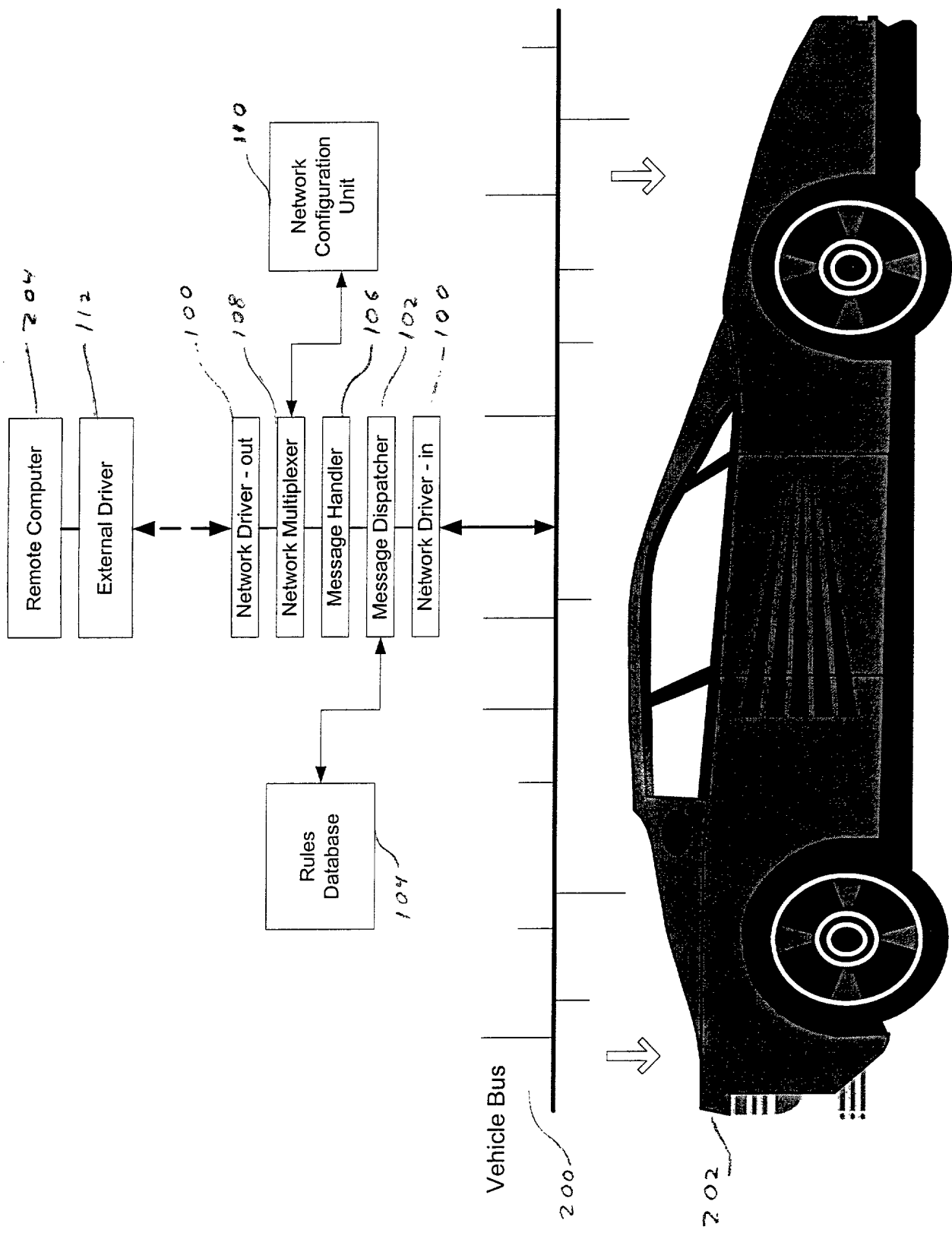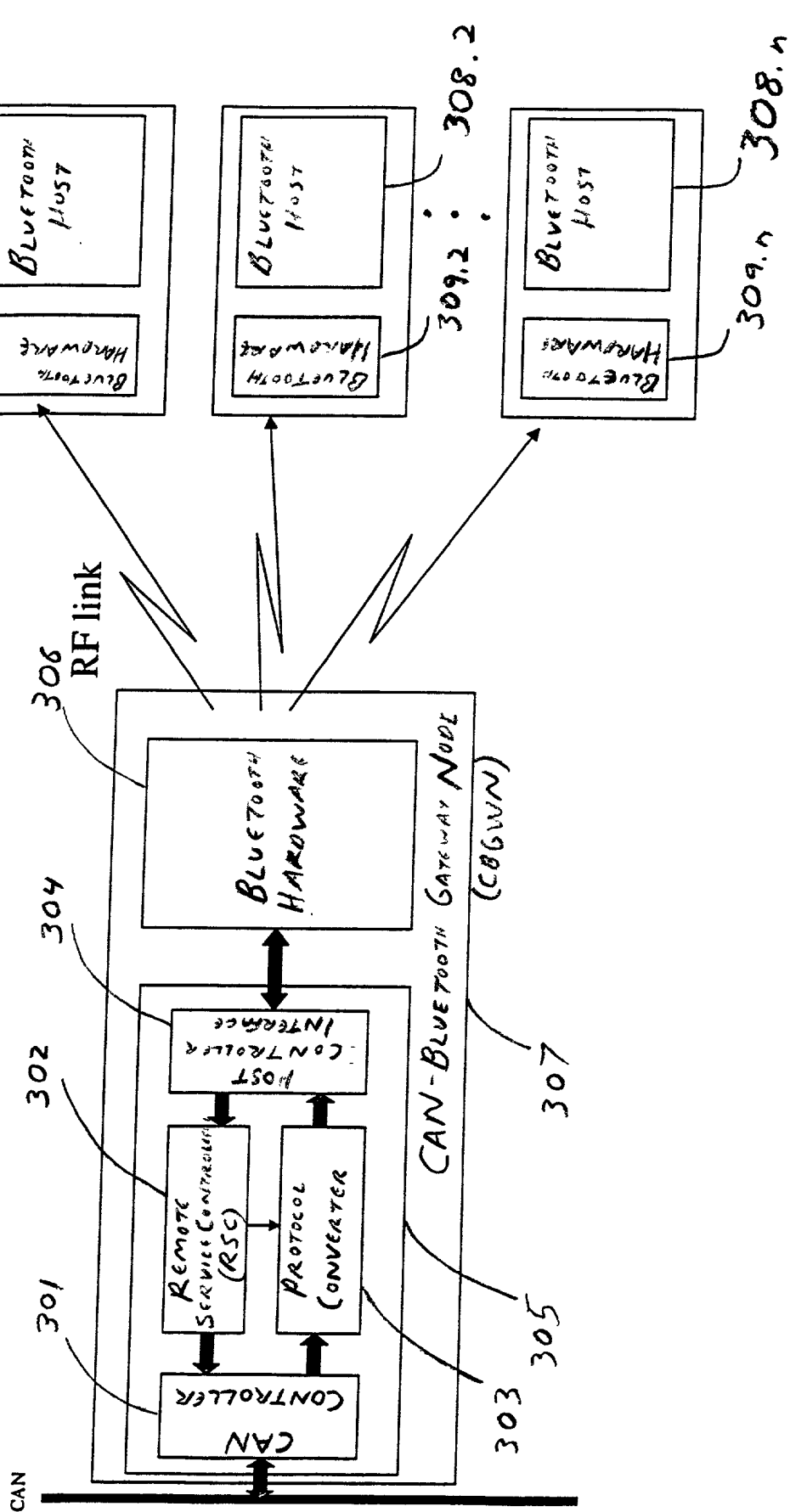
FIGURE 1

Figure 2

Figure 3

COMBINED DECLARATION AND
POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below adjacent to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled "WIRELESS ACCESS TO CLOSED EMBEDDED NETWORKS", and the specification of which:

[X]   is attached hereto;

[ ]   was filed as United States Application Serial No. _____ on

_____, ____ and was amended by the Preliminary

Amendment filed on _____, ____.

[ ]   was filed as PCT International Application No. _____, on

the — day of _____, ____.

[ ]   an English translation of which is filed herewith.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a). I hereby claim foreign priority benefits under Title 35, United States Code § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international applications(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the

United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S)
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119

Country :

Application No. :

Date of Filing:

Priority Claimed
Under 35 U.S.C. § 119 : [ ] Yes   [X] No

I hereby claim the benefit under Title 35, United States Code § 120 of any United States Application or PCT International Application designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations § 1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR
PCT INTERNATIONAL APPLICATIONS
DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. § 120

U.S. APPLICATIONS

Number :

Filing Date :

PCT APPLICATIONS
DESIGNATING THE U.S.

PCT Number :

PCT Filing Date :

I hereby appoint the following attorney(s) and/or agents to prosecute the above-identified application and transact all business in the Patent and Trademark Office connected therewith.

(List name(s) and registration number(s)):

Richard L. Mayer   Reg. No. 22,490
Gerard A. Messina   Reg. No. 35,952
Shawn W. O' Dowd   Reg. No. 34,687

All correspondence should be sent to:

Richard L. Mayer, Esq.
Kenyon & Kenyon
One Broadway
New York, New York 10004

Telephone No.:   (212) 425-7200
Facsimile No.:   (212) 425-5288

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full name of inventor: <u>Markus KLAUSNER</u>

Inventor's signature: _____   Date _____

Citizenship: Federal Republic of Germany

Residence: 3703 Wick Place
Wexford, Pennsylvania 15090
United States of America

Post Office Address: <u>Same as above</u>

Full name of inventor: Arne DIETRICH

Inventor's signature: Date

Citizenship: Federal Republic of Germany

Residence: 690 Fairmont Avenue
Mountain View, California 94041
United States of America

Post Office Address: Same as above